PATENT ABSTRACTS OF JAPAN

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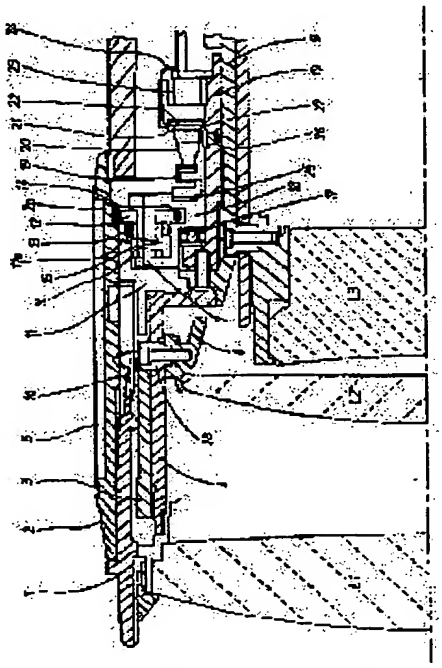
) LENS BARREL

)Abstract:
OBLEM TO BE SOLVED: To provide a lens barrel capable of driving an :ofocusing mechanism and a manual focusing mechanism without itching operation and giving a reduction ratio which can be changed to ving from a motor.
LUTION: A step gear is constituted of a large gear 12 interlocked with internal gear part 2a of a manual focusing operation ring 2, a small gear interlocked with the internal gear part 11a of a focusing coupling ring 11, ear shaft 14 in which the gears 12 and 13 are inserted in a rotatable te, a gear pressuring spring 15 being a winding spring pressuring the irs 12 and 13 and a spring presser 16 pressing the spring 15 and press- and engaged with the gear shaft 14. The step gear is inserted in a rotary ift 7 in parallel with the optical axis provided in an output ring 18 in an ily rotating state.



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AIMS

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aim(s)]
aim 1] The lens barrel characterized [core / the driving member which fixed the revolving shaft parallel to the ical axis of a lens barrel, a stage gear with two different numbers of teeth which rotates centering on this revolving ft, and / optical axis] by giving the interlocking section which it has [section] a pivotable focal lens migration ring . a manual operation ring, and interlocks this stage gear with this focal lens migration ring and a manual operation g in the lens barrel which has an oscillatory wave motor.
aim 2] The lens barrel according to claim 1 which divides this stage gear into a chain sprocket and a small gear, ries out the pressure welding of this chain sprocket and the small gear by the elastic member, and is characterized by ing friction to a stage gear.

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TAILED DESCRIPTION

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tailed Description of the Invention]
01]
ld of the Invention] This invention relates to the lens barrel which has the transfer device in which a focal lens is de to drive without switch actuation of autofocus actuation and manual focus actuation in more detail about the lens rel which has an oscillatory wave motor.
02]
scription of the Prior Art] In the transfer device in which a focal lens is made to drive without switch actuation of ofocus actuation of the lens barrel which has an oscillatory wave motor, and manual focus actuation conventionally a method which an autofocus device and a manual focus device are changed [method] to JP,2-253214,A and JP,2-217,A, and operates them nothing It has a roller rotatable as a core for the revolving shaft of the radiation direction ich intersects perpendicularly to the optical axis fixed to the focal lens migration ring. By making application-of-ssure pinching of this roller carry out in the direction of an optical axis between the rotors and manual focus uation rings which are the actuator of an oscillatory wave motor Whichever you make [of this rotor and this manual us actuation ring] it drive, the transfer device in which rotate this roller and a focal lens migration ring is operated is icated.
03] Moreover, by carrying out application-of-pressure pinching of many spherical rolling elements which can roll ly to the periphery of the revolution ring part material which makes JP,2-253210,A rotate a focal lens migration ring ween the rotors and manual focus actuation rings which are the actuator of an oscillatory wave motor, whichever you ke [of this rotor and this manual focus actuation ring] it drive, the transfer device in which rotate this roller and a al lens migration ring is operated is indicated.
04] Since this roller or this spherical rolling element rotates the transfer device in which the rotor of the above illatory wave motors makes a focal lens migration ring drive through a roller or a spherical rolling element, to a hoop ction by using a manual focus actuation ring as a floor when making a focal lens migration ring drive by the illatory wave motor, the reduction gear ratio of this rotor or this spherical rolling element, and this focal lens gration ring is fundamentally set to 2:1.
05]
oblem(s) to be Solved by the Invention] The transfer device currently indicated by JP,2-253214,A and JP,2-217,A Although a reduction gear ratio can be changed by using a roller with a stage for the roller which is carrying application-of-pressure pinching with the rotor and the manual focus actuation ring, distinguishing between the ssure-welding section of this rotor and this manual focus actuation ring, and carrying out application-of-pressure ching If it is going to enlarge a reduction gear ratio, the diameter difference of a roller with a stage must be extended, oller must be enlarged as a result, and enlargement of the whole device is caused.
06] Since the transfer device currently indicated by JP,2-253210,A is carrying out application-of-pressure pinching he spherical rolling element with the rotor and the manual focus actuation ring, it cannot change a reduction gear o.
07] Thus, it was difficult to enlarge the reduction gear ratio of this oscillatory wave motor and this focal lens gration ring, and when the driving torque of an oscillatory wave motor ran short, in the transfer device in_which a al lens migration ring is made to drive without switch actuation of autofocus actuation of the lens barrel which has an illatory wave motor, and manual focus actuation, aid was not able to give neither about a lens barrel with the large vement magnitude of a focal lens migration ring, nor the heavy lens barrel of the focal lens migration ring which ves.
08] In order to solve this problem, fix to the rotor section of this oscillatory wave motor the revolving shaft which

rsects perpendicularly with an optical axis, a manual actuation ring is made to carry out application-of-pressure tact of the revolution transfer member with a gear rotated centering on this revolving shaft, and these people apply the lens barrel (Japanese Patent Application No. 8-333114) which has the interlocking section which interlocks this olution transfer member with a gear, and this focal lens migration ring.

09] However, with the configuration of this lens barrel (Japanese Patent Application No. 8-333114), when a user s revolution actuation to the location which crossed the actuation range for the manual actuation ring, it lets between fields which the roller section of a revolution transfer member with a gear and this roller section of a manual ration ring roll slide, and it is necessary to make it friction setting out from which a revolution is not transmitted to oscillatory wave motor.

10] a path became about phi 70 from phi 50 , and in order it make above-mentioned friction setting out proper , the a of the field where precision required for rolling motion be high be widely required for the path of the friction face of a manual focus actuation ring , and they be an ingredient and processing top cost high with a general lens figuration that the construction material of the field which the roller section of a revolution transfer member with a r and this roller section of a manual actuation ring roll be easy restrict from relation , such as coefficient of friction a degree of hardness .

11] Furthermore, this rolling contact surface of rolling element is usually exposed, in order to roll or friction slide, y when the roller section of a revolution transfer member with a gear passes, and dust etc. is easy to adhere to this ing contact surface of rolling element.

12] If dust etc. enters between the fields which the roller section of a revolution transfer member with a gear and this er section of a manual actuation ring roll, connection will arise in actuation, and this lens barrel (Japanese Patent olication No. 8-333114) will produce **** in this rolling contact surface of rolling element depending on the case.

13]

eans for Solving the Problem] The lens barrel according to this invention in order to solve the above-mentioned nical problem has the driving member (output ring) which fixed the revolving shaft parallel to the optical axis of a s barrel, a stage gear with two different numbers of teeth which rotates centering on this revolving shaft, a focal lens gration ring pivotable centering on an optical axis, and a manual-operation ring, and is taken as the configuration ch gave the interlocking section which interlocks this stage gear with this focal lens migration ring and a manual- ration ring.

14] It adds to the object which makes a focal lens migration ring drive without switch actuation of autofocus ation and manual focus actuation by making it the above configurations, and the object whose modification of the action gear ratio to actuation of the focal lens migration ring from an oscillatory wave motor is enabled. By having ied out the pressure welding of the two different gear teeth of this stage gear by elastic members, such as a spring, having given friction By restricting a friction surface to the end face of a gear and a gear, the structure with friction stment easy moreover with the spring to which dust cannot adhere easily for a friction surface which does not need rge high-degree-of-accuracy side can be acquired.

15]

bodiment of the Invention] In the lens barrel of this invention, when a user operates a focal actuation switch first, rotor of an oscillatory wave motor and an output ring rotate the actuation actuation in the case of moving a focal lens he oscillatory wave motor centering on an optical axis according to an operation of a control circuit.

16] By it, the chain sprocket of a stage gear with two different numbers of teeth which rotates centering on a olving shaft parallel to the optical axis of a lens barrel fixed to the output ring is interlocked with the internal gear alled in the manual focus actuation ring bore, and this stage gear rotates. A focal connector link and a focal cam nder rotate centering on an optical axis through linkage of the small gear of this stage gear, and the inner gear of a al connector link by rotation of this stage gear. It moves in the direction of an optical axis through the koro by the with which the lens mirror room was cut by the front ring and the focal cam cylinder by this revolution, and focus ation is attained.

17] If the reduction gear ratio of the rotor at this time and a focal cam cylinder has the same module of each gear, it turn into a ratio with the numeric value which subtracted the small gear number of teeth from the number of teeth of number-of-teeth pair chain sprocket of a chain sprocket. Gear ratio will become large if gear ratio will become small e difference of the number of teeth of a chain sprocket and the number of teeth of a small gear is incidentally large, a difference becomes small. For this reason, high gear ratio can be obtained towards making a chain sprocket small.

18] Moreover, actuation actuation in case a user rotates a manual focus actuation ring manually and moves a lens ror room rotates centering on a revolving shaft parallel to the optical axis which a stage gear could not finish sting the friction of the rotor of an oscillatory wave motor, and a stator by revolution of a manual focus actuation

g, and was fixed to the output ring. A focal connector link and a focal cam cylinder rotate centering on an optical axis ough linkage of the small gear of a stage gear, and the inner gear of a focal connector link by this rotation. It moves he direction of an optical axis through the koro by the cam with which the lens mirror room was cut by the front ring the focal cam cylinder by this revolution, and focus actuation is attained.

19] If the reduction gear ratio of the manual focus actuation ring at this time and a focal cam cylinder has the same dule of each gear, it will become equal to the ratio of the number of teeth of the chain sprocket of a stage gear, and number of teeth of a small gear. Gear ratio will become small if gear ratio will become large if the difference of the nber of teeth of a chain sprocket and the number of teeth of a small gear is incidentally large, and a difference omes small.

20] As mentioned above, it can become possible to choose from the both sides of a manual focus actuation ring and oscillatory wave motor without switch actuation free, and to carry out focus actuation, and the lens barrel of this ention can change a reduction gear ratio by moreover changing the number of teeth of each size of a stage gear. By ing carried out the pressure welding of the two different gear teeth of this stage gear by elastic members, such as a ing, furthermore, and having given friction, a friction surface can be restricted to the end face of a gear and a gear, the structure with friction adjustment easy moreover with the spring to which dust cannot adhere easily for a friction face which does not need a large high-degree-of-accuracy side can be acquired.

21]

ample] With reference to a drawing, the example of the lens barrel by this invention is shown below.

22] Drawing 1 is the sectional view of the example of the lens barrel by this invention, and drawing 2 is the enlarged ail of the stage gear section.

23] In drawing 1 , a lens barrel has optical system L1, L2, L3, L4, and L5 and L6, and a non-illustrated camera is ipped with it by lens mount 39. 34 is the zoom ring to which L4 and L5 which are a migration lens group are rated, and it carries out adjustable [of the focal distance], and a manual focus actuation ring which 2 makes move which is a lens for focuses by the actuation at the time of a manual focus, and performs a focus.

24] In drawing 2 , as for 9, the motor base 10 is bis-concluded by the front ring 4 and the outer diameter at the left by the fixed cylinder of a lens barrel. It slides through the koro 28 bis-concluded by the mirror room 6 ompanying the cam groove whose bore of the front ring 4 is not illustrated [of the front ring 4 and the focal cam inder 3], and the lens L2 for focuses is attached. Fitting is carried out and, as for the focal cam cylinder 3, the focal nector link 11 is connected with the condition only with this pivotable regulation include-angle range in right-hand so that only include-angle within the limits regulated by the outer diameter of the front ring 4 may rotate.

25] A stage gear the gear shaft 14 inserted in the condition with pivotable chain sprocket 12 interlocked with inner r section 2a of manual focus actuation Ring 2, small gear 13 interlocked with inner gear section 11a of the focal nector link 11, and this chain-sprocket 12 smallness gear 13, and this chain-sprocket 12 smallness gear 13 the olving shaft 7 parallel to an optical axis which was constituted by the spring presser foot 16 by which press fit fitting s carried out to the presser-foot gear shaft 14 in the gear application-of-pressure spring 15 of the volume spring to ssurize, and this application-of-pressure spring 15, and was prepared in this output ring 18 -- a revolution -- it is erted in the easy condition.

26] Manual focus actuation Ring 2 has actuation rubber 5 in an outer diameter, and it is attached so that it can rotate [360 degrees] by the koro 47 shown in drawing 1 attached in the outer diameter of a front cover 1, and the outer meter of a front cover 1. Moreover, there is inner gear section 2a in a bore, and the chain sprocket 12 of this stage r is being interlocked with. It is pressurized in the radiation direction and the fixed load is hung on the revolution by ing section 1a furthermore prepared in this front cover 1. Thereby, when the actuation torque of the focal cam inder 3, the mirror room 6, and the lens L2 for focuses is heavy, the output from a rotor 19 lost the weight of this al cam cylinder 3, the mirror room 6, and the lens L2 for focuses, the stage gear rotated the focal connector link 11 as oor, and it has prevented turning this manual focus actuation Ring 2.

27] The stator 20, felt which are the annular oscillating member on which the electrostriction component 27 pasted the oscillatory wave motor used as an autofocus driving source, One end face of the annular oscillating absorber 21 ich consists of rubber etc., and the oscillating absorber 21 is touched. By oscillation of the spring base 24 used as the sser foot of the motor spring 23 which pressurizes the arranged annular stator guide 22 and this stator guide 22 to a or 20 side, and this motor spring 23, the stator stop 26 used as the niting of a stator 20, and a stator 20 It is stituted by many members of the motor base 10 grade which engages the rotating rotor 19 and shock absorbing ber 25, and the output ring 18 above-mentioned member with an outer-diameter side.

28] A rotor 19 is rotated in the direction of the optical-axis said alignment by the hoop direction progressive wave illation which a stator 20 generates. Application-of-pressure pinching of the stator guide 22 inserted into the spring

ɜ 24 and the motor base 10 at this time, the oscillating absorber 21, a stator 20, a rotor 19, shock absorbing rubber the output ring 18, and the bearing 17 is carried out with the motor spring 23. For this reason, the pressure welding he rotor 19 is carried out to the right end face of the output ring 18 and a bearing 17, and it is rotated with this a part ɔearing 17. The chain sprocket 12 of a stage gear and inner gear 2a of manual focus actuation Ring 2 which rotate tering on a revolving shaft parallel to the optical axis fixed to this output ring 18 at this time are interlocked with, this stage gear is rotated centering on an optical axis. By this motion, a focal cam cylinder rotates centering on an .cal axis with the focal connector link 11 currently interlocked with the small gear 13 of this stage gear, and the ror room 6 and the lens L2 for focuses are moved.

29] In the actuation from manual actuation Ring 2, this manual focus actuation Ring 2 is rotated manually. Inner gear :ut by manual focus actuation Ring 2 at this time is interlocked with a chain sprocket 12, and rotates this stage gear. this motion, the focal cam cylinder 3 rotates centering on an optical axis with the focal connector link 11 currently rlocked with the small gear 13, and the mirror room 6 and the lens L2 for focuses are moved.

30] If the friction by the application of pressure between a rotor 19 and a stator 20 is not enough at this time, while ıting manual focus actuation Ring 2 manually, if it turns intentionally more than scale angle of rotation, the ɔlution of manual focus actuation Ring 2 may be lost, and between a rotor 19 and a stator 20 may start. Here, it sets ɜo that between the size gears which divided the stage gear into two, a chain sprocket 12 and the small gear 13, and e divided before the rotor 19 and the stator 20 were slippery by adjusting the spring pressure of the gear application- ɔressure spring 15 may be slippery. Even when the application-of-pressure holding power between a rotor 19 and a or 20 is set up weakly by this, slipping between a rotor 19 and a stator 20 can be prevented.

31]

fect of the Invention] Differential of this stage gear carries out by considering as the configuration which gave the rlocking section which it has [section] a pivotable focal lens migration ring and a manual-operation ring, and rlocks this stage gear with this focal lens migration ring and a manual-operation ring the driving member which d the revolving shaft with the lens barrel of this invention parallel to the optical axis of a lens barrel as above- ıtioned, a stage gear with two different numbers of teeth which rotates centering on this revolving shaft, and tering on the optical axis. A focal lens migration ring can be made to drive without switch actuation of autofocus ıation and manual focus actuation by this. By having carried out the pressure welding of the two different gear teeth stage gear by elastic members, such as a spring, the top which can enable modification of the reduction gear ratio to ıation of the focal cam cylinder 3 from an oscillatory wave motor, and having given friction By restricting a friction face to the end face of a gear and a gear, it became possible to acquire the structure with friction adjustment easy eover with the spring to which dust cannot adhere easily for a friction surface which does not need a large high- ree-of-accuracy side.

32] In addition, although the Maki spring was used for the application of pressure of a stage gear as an elastic nber in the example of this invention, the elasticity of a pan spring, a wave washer, rubber, etc. may be used. reover, although the common gear was used for linkage with a stage gear, and a manual focus actuation ring and a al connector link, even if it is bevel gear and a bevel gear, it cannot be overemphasized that there is nothing a blem.

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AWINGS

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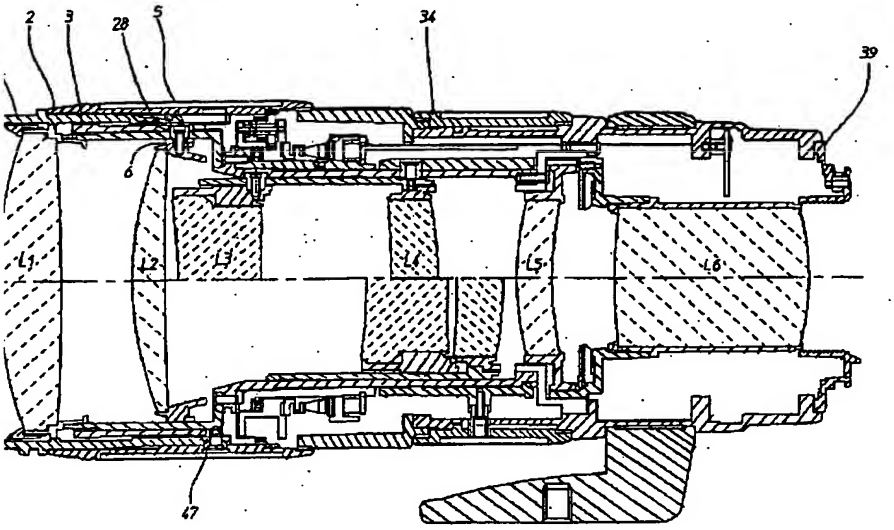
awing 1]



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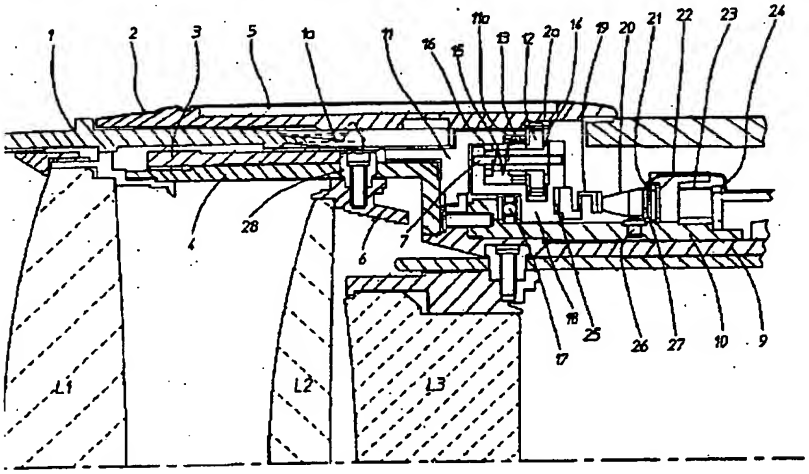

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7/09			Ａ	

審査請求　未請求　請求項の数２　ＦＤ　（全　５　頁）

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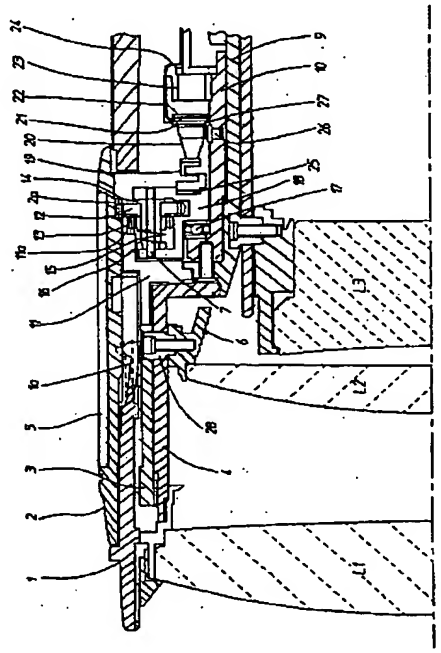
Ｆターム(参考)　2H044 BA04 BE05 BE11

(54)【発明の名称】　レンズ鏡筒

(57)【要約】
【目的】　オートフォーカス機構とマニュアルフォーカス機構とを切替え操作なしに駆動させることがデキ、さらにモーターからの駆動に変更可能な減速比を与えることができるレンズ鏡筒を提供する。
【構成】　段ギヤはマニュアルフォーカス操作リング２の内ギヤ部２ａと連動する大ギヤ１２、フォーカス連結環１１の内ギヤ部１１ａと連動する小ギヤ１３、該大ギヤ１２小ギヤ１３が回転可能な状態に挿入されたギヤ軸１４、該大ギヤ１２小ギヤ１３を加圧する巻きバネのギヤ加圧バネ１５、該加圧バネ１５を押さえギヤ軸１４に圧入嵌合されたバネ押さえ１６によって構成され、該出力リング１８に設けられた、光軸に平行な回転軸７に回転容易な状態に挿入されている。



４）はギヤ付回転伝達部材のローラー部とマニュアル操作リングの該ローラー部が転動する面との間にゴミ等が入ると作動に引っかかりが生じ、場合によっては該転動面に噛りを生じてしまう。

【００１３】

【課題を解決するための手段】前述の課題を解決するために本発明によるレンズ鏡筒は、レンズ鏡筒の光軸に平行な回転軸を固設した駆動部材（出力リング）と、該回転軸を中心に回転する二つの異なる歯数をもつ段ギヤと、光軸を中心に回転可能なフォーカスレンズ移動環と手動操作環とを有し、該フォーカスレンズ移動環と手動操作環に該段ギヤを連動させる連動部を持たせた構成とする。

【００１４】上記のような構成にすることにより、オートフォーカス駆動とマニュアルフォーカス駆動とを切り換え操作なしでフォーカスレンズ移動環を駆動させる目的と振動波モーターからのフォーカスレンズ移動環の駆動への減速比を変更可能にする目的に加え、該段ギヤの二つの異なる歯をバネ等の弾性部材によって圧接し、フリクションを持たせたことにより、摩擦面をギヤとギヤの端面に制限することによって、広い高精度面を必要としない、しかも摩擦面にゴミの付着しにくい、バネによってフリクション調整の容易な構造を得ることができる。

【００１５】

【発明の実施の形態】本発明のレンズ鏡筒において、振動波モーターによりフォーカスレンズを移動させる場合の駆動動作は、まず使用者がフォーカス作動スイッチを操作することにより制御回路の作用によって振動波モーターのローター、出力リングが光軸を中心にして回転する。

【００１６】それによって出力リングに固設した、レンズ鏡筒の光軸に平行な回転軸を中心にして回転する二つの異なる歯数をもつ段ギヤの大ギヤがマニュアルフォーカス操作リング内径に設置された内歯車と連動し該段ギヤが回動する。この段ギヤの回動により該段ギヤの小ギヤとフォーカス連結環の内ギヤの連動を介してフォーカス連結環とフォーカスカム筒が光軸を中心にして回転する。この回転によりレンズ鏡室がフロントリングとフォーカスカム筒に切られたカムによって光軸方向にコロを介して移動し合焦操作が可能になる。

【００１７】この時のローターとフォーカスカム筒との減速比は、各ギヤのモジュールが同一であれば、大ギヤの歯数対大ギヤの歯数から小ギヤ歯数を引いた数値との比となる。ちなみに大ギヤの歯数と小ギヤの歯数の差が大きいとギヤ比は小さくなり、差が小さくなるとギヤ比は大きくなる。このため大ギヤを小さくする方向で高いギヤ比を得ることが出来る。

【００１８】また、使用者が手動でマニュアルフォーカス操作リングを回転させてレンズ鏡室を移動させる場合の駆動動作は、マニュアルフォーカス操作リングの回転により段ギヤが振動波モーターのローターとステーターのフリクションに抗しきれず出力リングに固設された光軸に平行な回転軸を中心にして自転する。この自転により段ギヤの小ギヤとフォーカス連結環の内ギヤの連動を介してフォーカス連結環とフォーカスカム筒が光軸を中心にして回転する。この回転によりレンズ鏡室がフロントリングとフォーカスカム筒に切られたカムによって光軸方向にコロを介して移動し合焦操作が可能になる。

【００１９】この時のマニュアルフォーカス操作リングとフォーカスカム筒との減速比は、各ギヤのモジュールが同一であれば、段ギヤの大ギヤの歯数と小ギヤの歯数の比と等しくなる。ちなみに大ギヤの歯数と小ギヤの歯数の差が大きいとギヤ比は大きくなり差が小さくなるとギヤ比は小さくなる。

【００２０】以上のように本発明のレンズ鏡筒は、マニュアルフォーカス操作リング、振動波モーターの双方から切り換え操作なしで自在に選択し合焦操作をすることが可能になり、しかも段ギヤの大小それぞれの歯数を変えることにより減速比を変化させることができる。さらに該段ギヤの二つの異なる歯をバネ等の弾性部材によって圧接し、フリクションを持たせたことにより、摩擦面をギヤとギヤの端面に制限でき、広い高精度面を必要としない、しかも摩擦面にゴミの付着しにくい、バネによってフリクション調整の容易な構造を得ることができる。

【００２１】

【実施例】以下に図面を参照して本発明によるレンズ鏡筒の実施例を示す。

【００２２】図１は本発明によるレンズ鏡筒の実施例の断面図であり、図２は段ギヤ部の拡大詳細図である。

【００２３】図１において、レンズ鏡筒は光学系Ｌ１，Ｌ２，Ｌ３，Ｌ４，Ｌ５，Ｌ６を有し、レンズマウント３９によって不図示のカメラに装着される。３４は移動レンズ群であるＬ４およびＬ５を作動させ、焦点距離を可変させるズームリング、２がマニュアルフォーカス時の操作でフォーカス用レンズであるＬ２を移動させ焦点調節を行うマニュアルフォーカス操作リングである。

【００２４】図２において９はレンズ鏡筒の固定筒で左端にフロントリング４、外径にはモーターベース１０がビス締結されている。鏡室６はフロントリング４の内径を、フロントリング４、フォーカスカム筒３の不図示のカム溝に添ってビス締結されたコロ２８を介して摺動しフォーカス用レンズＬ２が取り付けられている。フォーカスカム筒３はフロントリング４の外径に規制された角度範囲内のみ回転するように嵌合されており右側にはフォーカス連結環１１が該規制角度範囲のみ回転可能な状態に連結されている。

【００２５】段ギヤはマニュアルフォーカス操作リング２の内ギヤ部２ａと連動する大ギヤ１２、フォーカス連

結環１１の内ギヤ部１１ａと連動する小ギヤ１３、該大ギヤ１２小ギヤ１３が回転可能な状態に挿入されたギヤ軸１４、該大ギヤ１２小ギヤ１３を加圧する巻きバネのギヤ加圧バネ１５、該加圧バネ１５を押さえギヤ軸１４に圧入嵌合されたバネ押さえ１６によって構成され、該出力リング１８に設けられた、光軸に平行な回転軸７に回転容易な状態に挿入されている。

【００２６】マニュアルフォーカス操作リング２は外径に操作ゴム５を持ち、フロントカバー１の外径と、フロントカバー１の外径に取り付けられている図１に示すコロ４７によって３６０° 自在に回転できるように取り付けられている。また内径には内ギヤ部２ａがあり、該段ギヤの大ギヤ１２に連動している。さらに該フロントカバー１に設けられたバネ部１ａによって放射方向に加圧され回転に一定の負荷が掛けられている。これによりフォーカスカム筒３、鏡室６、フォーカス用レンズＬ２の作動トルクが重い場合、ローター１９からの出力が該フォーカスカム筒３、鏡室６、フォーカス用レンズＬ２の重さに負け、段ギヤがフォーカス連結環１１を床として回動し、該マニュアルフォーカス操作リング２を回してしまうことを防いでいる。

【００２７】オートフォーカスの駆動源となる振動波モーターは電歪素子２７が接着された環状の振動部材であるステーター２０、フェルト、ゴム等からなる環状の振動吸収体２１、振動吸収体２１の一方の端面に接して配置された環状のステーターガイド２２、該ステーターガイド２２をステーター２０側へ加圧するモーターバネ２３、該モーターバネ２３の押さえとなるバネベース２４、ステーター２０の回転止めとなるステーター止め２６、ステーター２０の振動によって回転するローター１９、緩衝ゴム２５、出力リング１８上記部材を外径側に係合するモーターベース１０等の諸部材によって構成されている。

【００２８】ローター１９はステーター２０の発生する周方向進行波振動によって光軸同心方向に回転する。この時バネベース２４とモーターベース１０に挟まれたステーターガイド２２、振動吸収体２１、ステーター２０、ローター１９、緩衝ゴム２５、出力リング１８、ベアリング１７はモーターバネ２３によって加圧挟持されている。このためローター１９は出力リング１８とベアリング１７の右端面に圧接され該ベアリング１７の一部とともに回転する。この時該出力リング１８に固設した光軸に平行な回転軸を中心にして回転する段ギヤの大ギヤ１２とマニュアルフォーカス操作リング２の内ギヤ２ａと連動し、該段ギヤを光軸を中心に回動させる。この動きによって該段ギヤの小ギヤ１３に連動しているフォーカス連結環１１と、フォーカスカム筒が光軸を中心に回転し、鏡室６、フォーカス用レンズＬ２を移動させる。

【００２９】マニュアル操作リング２からの作動では該マニュアルフォーカス操作リング２を手動で回転させる。この時マニュアルフォーカス操作リング２に切られた内ギヤ２ａが大ギヤ１２に連動し、該段ギヤを回転させる。この動きによって小ギヤ１３に連動しているフォーカス連結環１１と、フォーカスカム筒３が光軸を中心に回転し、鏡室６、フォーカス用レンズＬ２を移動させる。

【００３０】この時ローター１９、ステーター２０間の加圧によるフリクションが十分でないとマニュアルフォーカス操作リング２を手動で回転させているとき、意図的にスケール回転角度以上に回すとマニュアルフォーカス操作リング２の回転に負けてローター１９、ステーター２０間が滑り出してしまう可能性がある。ここでは段ギヤを大ギヤ１２、小ギヤ１３の二つに分割し、ギヤ加圧バネ１５のバネ圧を調整することによってローター１９、ステーター２０が滑る前に分割された大小ギヤ間が滑るように設定する。これによりローター１９、ステーター２０間の加圧保持力が弱く設定されている場合でもローター１９、ステーター２０間の滑りを防ぐことができる。

【００３１】

【発明の効果】上記の通り、本発明のレンズ鏡筒はレンズ鏡筒の光軸に平行な回転軸を固設した駆動部材と、該回転軸を中心にして回転する二つの異なる歯数をもつ段ギヤと、光軸を中心に回転可能なフォーカスレンズ移動環と手動操作環とを有し、該フォーカスレンズ移動環と手動操作環に該段ギヤを連動させる連動部を持たせた構成とすることにより、該段ギヤを差動させる。これによってオートフォーカス駆動とマニュアルフォーカス駆動とを切り換え操作なしでフォーカスレンズ移動環を駆動させることができ、振動波モーターからのフォーカスカム筒３の駆動への減速比を変更可能にすることが可能な上、段ギヤの二つの異なる歯をバネ等の弾性部材によって圧接し、フリクションを持たせたことにより、摩擦面をギヤとギヤの端面に制限することによって、広い高精度面を必要としない、しかも摩擦面にゴミの付着しにくい、バネによってフリクション調整の容易な構造を得ることが可能となった。

【００３２】なお、本発明の実施例では弾性部材として段ギヤの加圧に巻バネを使用したが、皿バネ、ウェーブワッシャー、ゴム等の弾性を利用しても良い。また段ギヤとマニュアルフォーカス操作リング、フォーカス連結環との連動に平ギヤを使用したが、傘歯車、ハスバ歯車であっても問題無いことは言うまでもない。

【図面の簡単な説明】

【図１】本発明によるレンズ鏡筒の断面図。

【図２】振動波モーター、段ギヤ部の拡大詳細図。

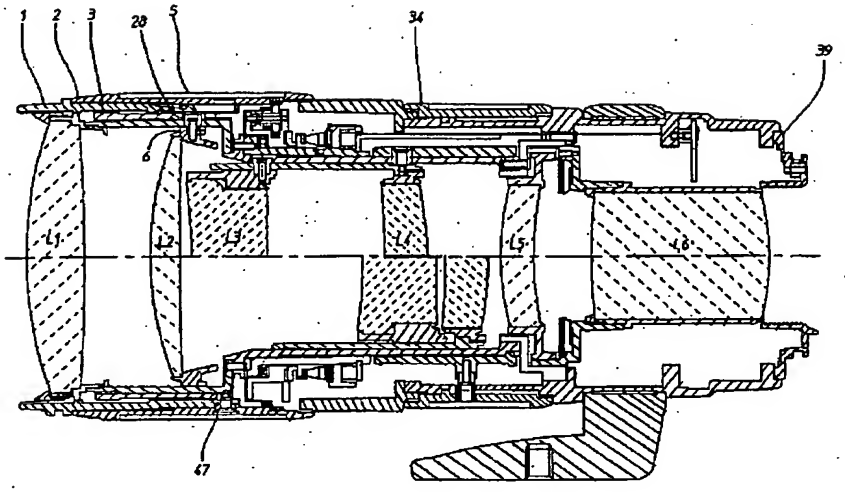
【符号の説明】

１　フロントカバー

２　マニュアルフォーカス操作リング

３　フォーカスカム筒
４　フロントリング
５　操作ゴム
６　鏡室
９　固定筒
１０　モーターベース
１１　フォーカス連結環
１２　大ギヤ
１３　小ギヤ
１４　ギヤ軸
１５　ギヤ加圧バネ
１６　バネ押え
１７　ベアリング
１８　出力リング
＊１９　ローター
２０　ステーター
２１　振動吸収体
２２　ステーターガイド
２３　モーターバネ
２４　バネベース
２５　緩衝ゴム
２６　ステーター止め
２７　電歪素子
２８　コロ
３４　ズームリング
３９　レンズマウント
４７　コロ
＊

【図１】



【図２】